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SPECIFICATION FOR TANGENT GALVANOMETERS

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SPECIFICATION FOR TANGENT GALVANOMETERS

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Indian Standard
SPECIFICATION FOR TANGENT GALVANOMETERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 23 August 1976, after the draft finalized by the Electrical Instruments Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Tengent galvanometer is used for the measurement of current in terms of magnetic field and deflection. This standard has been prepared to lay down certain minimum requirements consistent with quality and uniform test procedures for tangent galvanometers for the guidance of the manufacturers and users.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies the requirements and tests for tangent galvanometers for use in laboratories.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Anti-Parallax Mirror — The plane mirror mounted underneath the dial or scale for the purpose of avoiding error of reading due to parallax.

2.2 Base — The non-magnetic part fitted with levelling screws.

2.3 Base Plate — A circular plate over which the terminals are fixed.

2.4 Bobbin — A circular non-magnetic ring over which the specified number of turns of insulated wire are wound.

2.5 Body of Compass Box — The housing in which the scale, pointer, etc are fitted.

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*Rules for rounding off numerical values (*revised*).

2.6 Compass Box — An instrument which provides a line of reference from which angles may be measured.

2.7 Jewel — The part which forms bearing with the pivot in order to have a frictionless motion.

2.8 Levelling Screws — A threaded screw with knurled head fitted at the base for levelling the instrument.

2.9 Magnet — A bar magnet which exerts a permanent force on a current carrying conductor placed in its field.

2.10 Pillar — A non-magnetic cylindrical part on which the compass box is mounted.

2.11 Pivot — A support over which a magnet with pointer revolves.

2.12 Pointer — A non-magnetic needle terminating into sharp ends and at right angle to the magnet.

2.13 Scale — The circular dial having four equal quadrants graduated in degrees.

2.14 Sensitivity — The current required to produce a deflection of 45° in the galvanometer with the plane of the bobbin (coil) in the magnetic meridian.

2.15 Tangent Galvanometer — A galvanometer with a moving magnet, so arranged that the tangent of angle of deflection is proportional to the current to be measured.

2.16 Terminals — That portion of a circuit or piece of apparatus which is intended for the reception of conductors and by means of which it may be connected electrically to another circuit or piece of apparatus.

3. GENERAL REQUIREMENTS AND MATERIALS

3.1 Compass Box

3.1.1 *Body* — The body shall be of bakelite, aluminium or any other non-magnetic material, free from mechanical defects.

3.1.2 *Scale* — It shall be of aluminium, brass or any other non-magnetic material graduated in degrees and divided into four equal quadrants from 0 to 90°.

3.1.3 *Anti-Parallax Mirror* — A plane mirror shall be mounted under dial or scale of the compass box for the purpose of avoiding error of reading due to parallax.

3.1.4 *Pointer* — The pointer shall be light and rigid and made of non-magnetic material. It shall be so shaped as to lend itself to easy and accurate readings. The length of the pointer other than knife edge pointer shall be such that the tip extends over more than one-third, but not more than two-thirds of the length of the shortest scale mark.

3.1.5 *Magnet* — A permanent bar magnet properly aged and having high coercivity shall be used. The north pole of the magnet shall be marked with one red dot. The pointer shall be fixed at right angle to the magnet.

3.2 Pillar — The pillar shall be of non-magnetic material of adequate thickness, the upper part of which shall fit flush under the groove of the compass box.

3.3 Bobbin — Bobbin shall be of suitable insulating and non-magnetic material and its internal diameter shall be not less than 15 times the length of the magnet.

3.4 Base — Base shall be of suitable insulating and non-magnetic material and fitted with levelling screws.

3.5 Base Plate — Base plate shall be of suitable insulating and non-magnetic material of diameter not less than 100 mm.

3.6 Terminals — The terminals shall be of brass electroplated with nickel having properly knurled heads. The diameter shall be not less than 12 mm.

3.7 Levelling Screws — The screw rods of the levelling screws shall be of brass electroplated with nickel and shall be not less than 5 mm in diameter. The diameter and thickness of knurled disc shall be not less than 25 mm and 5 mm respectively. Levelling screws shall be provided with check nuts.

4. CONSTRUCTION

4.1 The magnet shall be horizontal. The centre of the coil shall coincide with the magnet centre.

4.2 The bobbin shall be fitted exactly perpendicular to the base plate and shall be capable of free and smooth rotation. Enamelled wire of suitable diameter and appropriate number of turns shall be wound on the bobbin. The overload capacity of the windings shall be adequate. Terminals shall be provided on the base plate for connection of these turns. They shall be properly marked indicating the number of turns.

5. MARKING

5.1 The tangent galvanometer shall be marked with the following:

a) Manufacturer's name or trade-mark,

b) Manufacturer's serial number and type,

c) Sensitivity,
d) Number of turns,
e) Current rating, and
f) Country of manufacture.

5.1.1 The tangent galvanometer may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. TESTS

6.1 Type Tests — The following shall constitute the type tests and shall be carried out in the sequence given below:

a) Insulation resistance test (**6.3**),
b) High voltage test (**6.4**), and
c) Sensitivity test (for all tappings) (**6.5**).

6.1.1 *Number of Samples and Criteria for Conformity* — Type tests shall be applied to three test specimens; in the event of one specimen failing to comply in any respect, a further set of three specimens shall be taken all of which shall comply with the requirements of this standard.

6.2 Routine Tests — The following shall constitute routine tests and shall be carried out in the sequence given below:

a) Insulation resistance test (**6.3**),
b) High voltage test (**6.4**), and
c) Sensitivity test (for all tappings) (**6.5**).

6.3 Insulation Resistance Test — When the moving system is insulated from the body of the galvanometer, the insulation resistance between the two terminals connected together and the metallic body or case when measured at 500 ± 50 V dc after one minute of electrification shall be not less than 100 megohms.

6.4 High Voltage Test — When the moving system is insulated from the body of the galvanometer, no breakdown, arcing or sparking shall occur when an ac voltage of 1 000 V (rms) is applied gradually and maintained for a period of 1 minute across the two terminals connected together and the metallic body or case.

6.5 Sensitivity Test (For All Tappings) — The measurement of sensitivity shall be done by using a suitable ammeter. The sensitivity shall be determined for all the tappings from the current required to produce a deflection of 45° in the galvanometer. The sensitivity of the galvanometer, when new, as measured for different tappings on both sides of zero, shall not differ by more than 5 percent of the marked value.

6.5.1 This value of current is a constant at a place denoted by K and depends upon the number of turns of wire on the bobbin and is derived from the following equation:

$$I = \frac{H\,r}{2\,\pi\,N} \tan\theta = K \tan\theta$$

where

I = current passing through the coil;
H = horizontal component of earth's magnetic field;
r = mean radius of the coil;
N = number of turns on the coil;
θ = the angle of deflection; and
K = a constant, called reduction factor of the galvanometer.

INDIAN STANDARDS
ON
ELECTRICAL INSTRUMENTS

IS :	
1248-1968	Direct acting electrical indicating instruments (*first revision*)
1565-1966	Electrical apparatus comprising resistors (*revised*)
1765-1966	dc potentiometers for laboratory and industrial uses (*revised*)
1885 (Part XI)-1966	Electrotechnical vocabulary: Part XI Electrical measurements
2032 (Part X)-1969	Graphical symbols used in electrotechnology: Part X Measuring instruments
2419-1963	Dimensions of electrical indicating instruments
2442-1963	dc moving coil galvanometers
2992-1965	Insulation resistance testers (hand-operated)
3107-1974	Portable multipurpose direct acting electrical indicating instruments (*first revision*)
3635-1966	Methods of test for resistance of metallic electrical resistance material
3636-1966	Method of test for temperature coefficient of precision resistor wires
6236-1971	Direct recording electrical measuring instruments
7889-1975	Vibration galvanometers
7890-1975	Ballistic galvanometers
7914-1975	Standard cells
8143-1976	Plugs and keys for resistance boxes
8160-1976	Tangent galvanometers

AMENDMENT NO. 1 NOVEMBER 1980

TO

IS:8160-1976 SPECIFICATION FOR TANGENT GALVANOMETERS

Corrigendum

(*Page 3, clause 0.2*) - Substitute 'Tangent galvanometer' *for* 'Tengent galvanometer'.

(ETDC 48)

Reprography Unit, ISI, New Delhi